California

LOS ANGELES RIOT FIRES

August 12-15, 1965

National Fire Coordination Study

U.S. DEPARTMENT OF AGRICULTURE / FOREST SERVICE / DIVISION OF FIRE CONTROL

LOS ANGELES RIOT FIRES

August 12-15, 1965

A study of organization for fire suppression and a projection of the threat to life and resources had the fires resulted from a nuclear thermal attack.

A Working Paper Prepared
by
Theodore G. Storey, USFS

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CONTENTS

	Page
INTRODUCTION	1
STUDY OBJECTIVES	3
GENERAL ASSUMPTIONS	6
DESCRIPTION OF LOS ANGELES URBAN FUELS	7
THE RIOT FIRES	10
General Descriptions	10
Fuels	14
Weather	18
Chronology	19
Fire Behavior	20
Organization	23
OPERATIONS AND TACTICS	25
Descriptions	25
Application to Nuclear Fires	32
Conclusions	34
SHELTERS AND NUCLEAR FIRE THREAT	35
Shelters	35
Fire Threat	41
OBSERVATIONS	42
GENERAL CONCLUSIONS	45
RECOMMENDATIONS	48
APPENDIX	49

FIGURES

Fig. No.		Page
1	Location of curfew area in relation to city center.	4
2	Curfew area showing location of burned, looted, damaged or destroyed buildings, and fatalaties.	5
3	Urban fuels such as this complex of stores and residences makes firefighting difficult and increases the chances of a conflagration. (Los Angeles County Fire Department Photo)	9
4	Four buildings burning on Avalon Blvd. Friday afternoon August 13, 1965. (United Press Int'l. Photo)	11
5	Business establishments destroyed by fire. Intersection of Central Ave. and 45th Street. (Photo courtesy of Los Angeles Fire Department)	12
6	Three fires burning along Broadway between 41st Street and 56th Street. The Harbor Freeway is shown at the left and the city center can be seen through the smoke at the right. (Los Angeles County Fire Department Photo)	17
7	At Beach Street, looking down 103rd Street in the Watts area on Friday afternoon. Most of the buildings on the right were also eventually burned. (Los Angeles Fire Department Photo)	22
8	Engine company from a Los Angeles County Fire Department task force responding to a market fire at 4730 Avalon Blvd. during the Riot Fires. (Los Angeles County Fire Department Photo)	26
9	Equipment pool and command post on edge of curfew area operated by Los Angeles City Fire Department. (Los Angeles City Fire Department Photo)	30
10	Task Force Engine Company of Los Angeles County Fire Department using the "flood and run tactic". Fireman at left is wearing a flak suit borrowed from the Military. (Los Angeles County Fire Department Photo)	31

Fig. No.		Page
11	Command center, Los Angeles City Fire Department monitoring live TV coverage of the fire area by helicopter to get the latest information on fire occurrence and spread. (Photo courtesy of Los Angeles City Fire Department)	33
12	Boundaries of Riot Fire area and Civil Defense shelter zones in Los Angeles.	36

TABLES

Table No.	Title	Page
1	Population and Shelter Space Summary, Curfew Area, Los Angeles Riot Fires.	37

INTRODUCTION

Background work for the National Fire Coordination Study, Project 229, requires the study of large fires in urban areas, and in areas where the settlement pattern is mixed urban and rural. These studies are designed to search out factors important to better utilize Federal, state, local, and private fire organizations in effective control of large fires resulting from natural causes or from an enemy attack.

Most peacetime fires in urban areas are far from being representive of the fires that might result from an enemy attack. Such fires generally involve a comparatively small area and fire services are not greatly hampered in their efforts at controlling the blazes. However, large peacetime fires provide a realistic set of circumstances for evaluating the ultimate threat to the people and resources in the immediate area where the fires occur. Thus they provide some measure of what might be accomplished through the efforts of an organized fire service.

Infrequently a disaster occurs in peacetime that is somewhat representative of the fire situation which might develop following nuclear attack. The Riot Fires of August 12-15, 1965, in Los Angeles was such a disaster. The large area and high density of nearly simultaneous fires occurring in a built-up urban area and the limited firefighting that was

possible was analogous in many respects to the situations following an attack with nuclear weapons. These factors, plus the complete fire documentation available, particularly photographic, probably makes this incident unique in American history as a fire case study.

One of the major findings in the Phase One Report[1/] was that fire would be significant causative agent in the loss of lives and resources in a nuclear attack. With the population in residences, fire would be less significant since a larger percentage of the people would lose their lives as a result of blast and fallout. Conversely, with shelters available and occupied, more people will survive the immediate effects of blast and the longer term effects of radioactive fallout. They would then be threatened by the fires that would result from the thermal effect of the weapons or the secondary ignitions caused by blast damage.

With these considerations in mind it was decided to study the fire aspects of the civil disturbance in Los Angeles and assess these fires in terms of what could be learned and applied to the objectives of the National Fire Coordination Study. This study of the Los Angeles fires was not made for the purpose of re-evaluating the fire suppression strategy or tactics, or effectiveness of mutual aid response. Nor is this study concerned with the social aspects of the incident.

1/ Phase One Report, by W. R. Moore, J. W. Jay, and J. H. Dieterich, Division of Fire Control, National Fire Coordination Study, U. S. Forest Service, Washington, D. C., March 1965.

Figure 1 is a map of Los Angeles showing the curfew area where the riot fires were located in relation to the city center. Figure 2 shows the curfew area and location of buildings that were burned, looted, or damaged. All these points do not represent fires. Shown also are locations where fatalaties occurred.

STUDY OBJECTIVES

The main objectives of the Los Angeles Fires study are to describe the organization and tactics used by the fire services in suppressing the fires; project the case history of these fires into conditions of fallout created by an assumed nuclear attack; and examine the resultant fire threat and demands on the fire services with particular emphasis on the problem of defending fallout shelters from fire. More specifically, the following points were considered.

1. What changes in normal organization and procedures were necessary that would be applicable to suppressing fires following nuclear attack?

2. What effective fire suppression action could be accomplished in a one-hour period before critical radioactive fallout arrived?

3. What is the fire threat to a sheltered population in areas adjacent to the fire?

4. Would simultaneous multiple ignitions caused by the thermal pulse create a situation that could be handled in the first hour - handled at all?

5. Would evacuation be possible or desirable under the assumed conditions of attack?

6. How far would the fire be expected to spread before being stopped by natural barriers?

7. Could fire control priorities be established to limit fire development in certain areas?

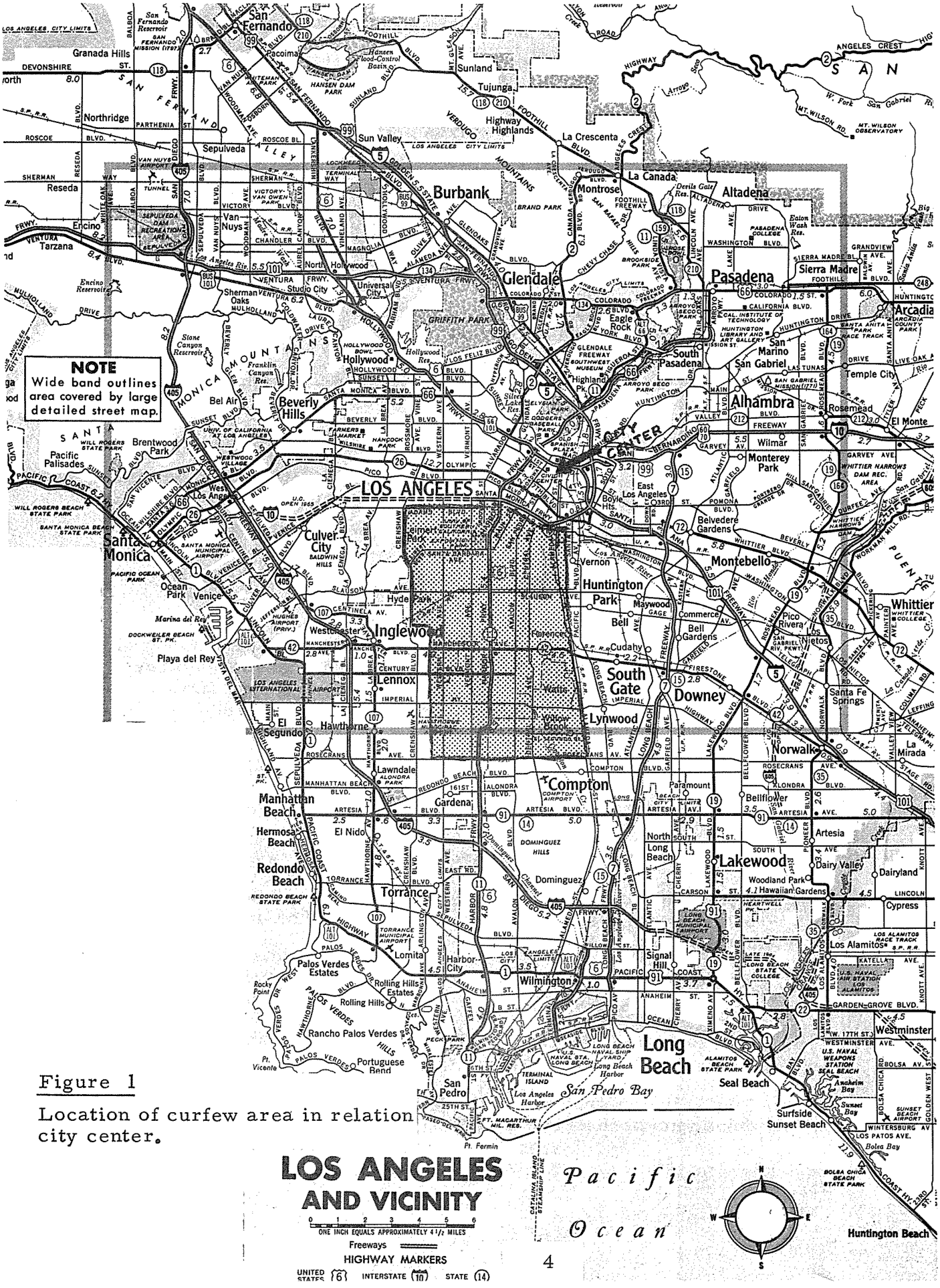

Figure 1

Location of curfew area in relation city center.

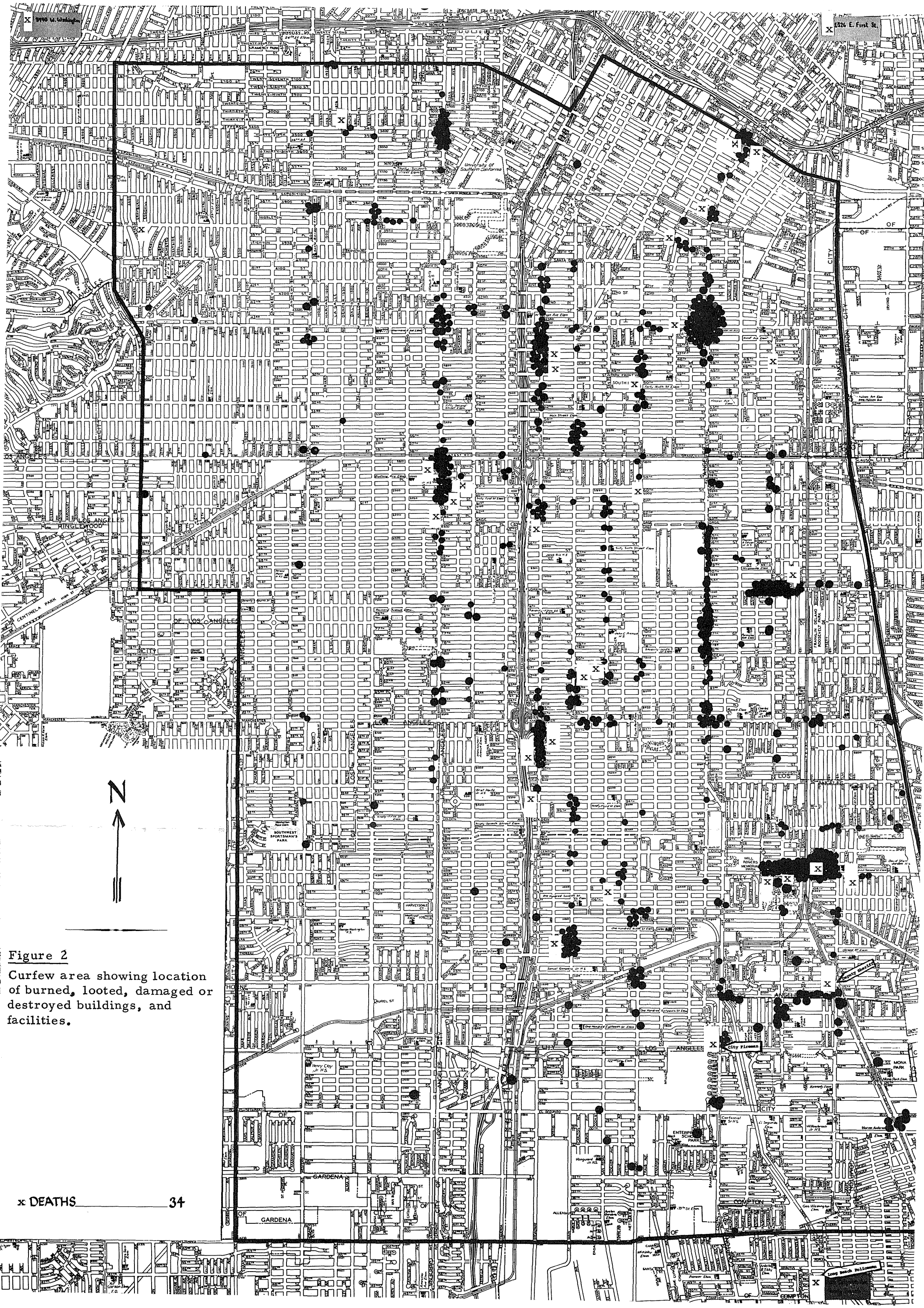

Figure 2

Curfew area showing location of burned, looted, damaged or destroyed buildings, and facilities.

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GENERAL ASSUMPTIONS

The following assumptions were made to help project these fires into conditions that might prevail during a nuclear attack:

1. Fire incidence from the assumed attack was the same as it actually occurred including fire behavior, chronology of events, weather conditions, and suppression action.

2. All fires occurred simultaneously and there was only one hour of effective firefighting time before fallout arrived. With mutual aid: without mutual aid.

3. Available shelter spaces are occupied when fire occur.

4. The fire services are in a regular state of readiness and have not called in off-duty firemen.

DESCRIPTION OF LOS ANGELES URBAN FUELS

Los Angeles' urban fuels present a great contrast in conflagration potential ranging from extreme in the hilly residential sections of the city to rather low in the older residential sections on the coastal plain. The riot fires occurred in the latter type of fuel. Throughout the city the pattern of building is fairly wide streets, wide spacing between structures, and low building heights. Only in the city center and in limited areas adjacent thereto do building densities exceed 20 percent (ratio of roof to ground) and buildings are more than a few stories tall. The tallest building in the city is only 28 stories high. Most cities of similar size, including the downtown area and the suburbs, are built up much higher vertically.

The high conflagration potential along the mountainous front country is due to a combination of flammable building construction, flammable vegetation between structures, steep topography, and frequent severe fire weather. The strong, dry Santa Ana winds of the winter and spring are especially conducive to rapid fire spread. In the flatter portions of the Los Angeles basin the conflagration potential is moderate. The possible exception to this is when the Santa Ana winds blow. The factors of wide spacing between the houses, wide streets, low building heights and more fire-resistive construction are not conductive to fire spread.

Reports[2/] have rated Los Angeles high in the conflagration potential compared to many other large cities in the United States. However, this is based largely on the explosive situation existing on the city fringes, not on conditions in the city proper. By far, the largest portion of the city, including the area involved in the riot fires is of latter type and has rather low potential for conflagrations.

Recent redevelopment projects and urban renewal have converted some of the potentially hazardous areas in the downtown and older residential portions of the city to tolerable levels of fire susceptibility. New access highways and freeways have broken up the former large continuous blocks of urban fuels. The Harbor Freeway, for example, bisects the riot area north to south and the Santa Monica Freeway separates the riot area from the high-hazard urban fuels immediately to the north. However, large areas of critical fuels remain.

The situation in the high-hazard "front" country at the base of the mountains also is improving. Ordinances have been passed requiring fire-safe building construction and clearing away of brush around residences. Construction of fuel breaks is increasing. However, in the meantime, the Los Angeles fire services must continue to fight these difficult fires where spacing, construction, and exposure of the building are so important (Fig. 3).

2/ Report Memo on meeting with the National Fire Protection Association, by J. H. Dieterich, USFS, Division of Fire Control, National Fire Coordination Study, Washington, D. C., October 22, 1964.

Figure 3. Urban fuels such as this complex of stores and residences makes firefighting difficult and increases the chances of a conflagration .(Los Angeles County Fire Department Photo)

THE RIOT FIRES

General Descriptions

During the period August 12-15, 1965, approximately 1,500 fires were set by rioters in a 46 square mile area of older business and residential occupancies in south Los Angeles (Fig. 4). More than 600 buildings were officially listed as burned and looted including more than 200 totally destroyed by fire.[3/] [4/] [5/] [6/]

Many fires were rekindled one or more times and other fires were extinguished in their incipient stages by residents or by firemen. More than 3,000 alarms were recorded by the fire services during the disaster.

Damage to property alone was estimated at nearly $50,000,000. Thirty-four persons were killed in the riots one of them, a fireman, directly attributable to fire. Some of the business establishments that were destroyed ~~as~~ are shown in Figure 5, the intersection of Central Avenue and 45th Street.

3/ Violence in the City -- An End or a Beginning? by the Governor's Commission on the L. A. Riots, State of California, Dec. 2, 1965 101 pp., illus.

4/ The South-Central Los Angeles Riot Fires, Aug. 12-17, 1965, by the Los Angeles Fire Dept., Jan. 1966, 36 pp. illus.

5/ The Mid-August 1965 South-Central Los Angeles Riot, Statistical Report of Emergency Operations by the Los Angeles Fire Dept., Sept. 10, 1965, 62 pp. illus.

6/ Riot Fires Report -- Watts Area Aug. 11-18, 1965, by the Los Angeles County Fire Dept., Sept. 10, 1965, 30 pp. illus.

Figure 4. Four buildings burning on Avalon Blvd. Friday afternoon, August 13, 1965. (United Press International Photo)

Figure 5. business establishments destroyed by fire. Intersection of Central Ave. and 45th Street. (Photo courtesy of Los Angeles Fire Department

The number of fires far exceeded the suppression capacity of the fire services. In addition, firemen were hampered by the rioters from responding to the fires and taking action to suppress them. Consequently the fires burned practically at will. No conflagration or firestorm developed although certain factors favoring their occurrence were present. Many instances of fire spread from building to building, both by radiation and flaming brands, were reported. Two individual square blocks were completely destroyed by the flames.

The fire services were severly extended fighting the Riot Fires and at the same time maintaining adequate coverage elsewhere in the city and county. They were forced to adapt and change their normal organization and suppression methods to fit the unusual situation.

Several fire houses in the curfew area had to be evacuated. Suppression forces were reorganized on the periphery of the fire area and controlled from field command posts and equipment pools. Task forces were organized which made quick sorties into the affected area. These and other tactics were borrowed or adapted from brush firefighting methods.

Mutual assistance among the fire services, police services, the National Guard, and the California Disaster Office played a vital role in handling the emergency.

On Saturday afternoon, August 14, for the first time in California's history a State of Extreme Emergency was declared by the Governor (Appendix).

Fuels

For purposes of this report the boundaries of the fire area are the same as those of the curfew area (Fig. 2). Occupancies within the area range from small single-family dwellings to large manufacturing plants. Residences in the southern portion of the district are primarily small one-story buildings. Larger dwellings, many of them two-stories tall, are located in the northern part of the district. A large majority of all dwellings in the area are at least 30 years old.

Closely grouped two-story, garden-type apartment houses, containing eight units each, are located along Main Street and other principal streets in the southern portion of the district. A number of large public Housing Projects are situated in the area, primarily in the Watts section.

Manufacturing occupancies range in size from small job shops to large plants covering many acres. One of the larger manufacturing concentrations in the area is the Goodyear Tract located near Gage and Central.

Multi-story buildings are located in the extreme northern section of the area. This section of the riot area is a portion of the fringe area of the downtown metropolitan district with its multitude of apartment houses and business occupancies.

Some prominent landmarks in the area are: the Sports Arena, the Coliseum, Wrigley Field, the County Museum, and the University of Southern California. All of these occupancies are in the northern one-third of the fire area.

Small to large business occupancies are located along the principal streets. The principal business section of the Watts area is centered on 103rd Street east of Compton Avenue. The fires were confined almost exclusively to business occupancies.

Side streets in the curfew area are somewhat narrow. However, most of the houses are set on small individual lots with fairly wide spacing along the block and between backyards. Yards are generally fairly well-kept and houses well-maintained.

Most of the residences are single-story and of wood-frame construction with wood or stucco exteriors and composition roofs. Many had wood roofs originally but were replaced with composition when the original covering wore out.

Topography in the fire area is nearly flat with only a slight slope to the ocean to the south.

There are several important fuel breaks in and near the curfew area. The 8-lane Harbor Freeway bisects the area north to south (Fig. 6). The Santa Ana Freeway parallels the Harbor Freeway a short distance to the east of the east boundary of the curfew area. Imperial Highway, a wide boulevard, crosses the area in a east-west direction in the southern half of the zone.

The 8-lane Santa Monica Freeway is located just to the north of the curfew area. It runs in an east-west direction and partially separates the area from the more heavily built-up downtown area. In the area of interest, however, the Freeway is elevated on concrete pillars leaving the area below open. Although the open area is fairly clear of fuel, brands could blow across this opening to ignite fuels on the other side. The Harbor Freeway and the Santa Ana Freeway are sunken or are elevated on earth fill. Openings occur only every few blocks where cross streets pass beneath the Freeway.

Most of the principal streets in the area are fairly wide. These occur at intervals throughout the area and are oriented in both east-west and north-south directions.

Figure 6. Three fires burning along Broadway between 41st Street and 56th Street. The Harbor Freeway is shown at the left and the city center can be seen through the smoke at right . (Los Angeles County Fire Department Photo)

Most residences and some businesses are set back from the streets and the intervening spaces landscaped with lawns and shrubbery. None of this vegetation appeared to be flammable and capable of communicating fire. Some backyards and vacant lots contained dry grass and household debris. However, this did not appear to constitute an important source of potential fire spread.

Weather

During the riots and for several days preceding, the Los Angeles area was blanketed by hot, moist air originating in the Gulf of Mexico. Daytime temperatures in the riot area were in the high 90's and humidities in the 60's, the latter being considerably above average. Skies were cloudy with thunderheads in the mountains.

The normal brisk afternoon seabreeze prevailed until Friday evening. This blew from the Pacific Ocean to the south. From the time that the breeze subsided Friday afternoon until Sunday when the riots were over there was practically no air movement day or night. Such long periods with no air movement are very unusual in Los Angeles.

The lack of wind and high humidity, particularly the former, may have kept the fires from spreading more than they did. Experienced urban fire control officials were unanimous in their opinion that with even a

moderate prevailing wind the fires would have developed into a conflagration. Since the prevailing wind direction is south the fires would have spread north toward the more heavily built-up downtown fringe area and, possibly, into the city center. A north wind would have spread the fire toward the ocean to the south.

Chronology

The first fire was reported late Thursday night. For the next 72 hours, until Sunday night, fires occurred intermittently at widely scattered points throughout the area.

Until Friday night the fires were not numerous. Fire equipment had difficulty getting through the rioters to fight the fires but thermal threat was not great.

About dusk on Friday, however, the number of alarms began to increase rapidly. This built up until about midnight and then tapered off. By 2 a.m. Saturday the fire area was fairly quiet. It remained so until about 8 p.m. Saturday night when the pattern of multiple ignitions resumed. From 2 a.m., Sunday on, there were very few new fires.

Fire Behavior

There were two main periods of fire threat during the disaster. These were the 6-hour periods, 8 p.m. to 2 a.m., on Friday night August 13, and again on Saturday night August 14. Nearly all of the riot fires occurred in these two periods. The thermal threat was worse on Friday night than on Saturday night. Slightly more fires occurred on Friday night, they were concentrated in a small area, and they burned freer because less firefighting was possible. On Saturday night there was a lower density of fires and more firefighting was possible. The National Guard was available Saturday night to provide protection for the fire forces and to enforce the curfew.

On both nights, the number of ignitions increased greatly after nightfall and appeared to peak around midnight. The Los Angeles Fire Department has determined that 1 a.m. Saturday morning was the time of peak involvement of their forces. At this time there were more than 100 fire companies engaged in fighting fires or attempting to fight them. Since it is known that the fire services were unable to put equipment on each fire it is not unreasonable to assume that there were between 150 and 200 fires burning at this time.[7/]

7/ The Office of Civil Defense is sponsoring a study of fire behavior of the Los Angeles Riot Fires. One of the things it will do is seek to establish the time history of each fire.

In each of the periods of fire threat there appeared to be a sufficient number and density of fires to pose a serious threat of firestorm. In addition there was practically no wind. However, firestorms did not develop. Both aerial and ground observers reported many instances of fire spread from building to building some involving several structures. Two individual blocks were completely leveled by flames (Fig. 7). Fire brands carried aloft from burning structures were seen to set new fires in the vicinity. However, the fire services expressed surprise at the small number of fires set by brands. Many fires were spread by thermal radiation. Most fires, however, were of incendiary origin principally from gasoline bombs or "Molotov cocktails".

There are several possible reasons why firestorms did not develop; including too few or too low a density of simultaneously occurring fires, high humidity, stable air aloft, and fire resistive roofs. Probably it was due to a combination of these factors.

There were several instances of all or a large majority of the buildings on both sides of the street along a block burning simultaneously. In no case, apparently, were the fires so intense as to prevent pedestrians from passing along the streets.

Figure 7. At Beach Street, looking down 103rd Street in the Watts area on Friday afternoon. Most of the buildings on the right also eventually burned. (Los Angeles Fire Department Photo)

Organization

Approximately 75 percent of the riot area is within the protection boundary of the City Fire Department and 25 percent is protected by the County Fire Department. In the main fire area in and around the Watts section, however, the area protected by the two services is about 50:50. Mutual response along their common boundary is covered by existing agreements of long standing. 8/

Both fire services appeared to cooperate closely during the emergency regardless of jurisdiction. Units from adjoining cities were "moved up" to cover both city and county fire houses. This assistance also is covered by existing agreements.

The California Disaster Office made their equipment available to the fire services. Except for their communication vans none of it was actually used. However, Fire and Rescue Division pumpers were either in the area or on standby in nearby cities during the action. The Chief of the Fire and Rescue Division was stationed at the Los Angeles County Fire Headquarters with the Chief Engineer during the crisis. The Chief Engineer is the Area Coordinator in the California Disaster Office organization.

The declared State of Extreme Emergency put the California Division of Forestry under California Disaster Office direction. Some California Division of Forestry equipment was altered for possible

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8/ Los Angeles Mutual Aid Study, by T. G. Storey and C. T. Harrison. U. S. Forest Service, Division of Fire Control, National Fire Coordination Study, Washington, D. C., March 1965, 109 pp., illus.

action in the fire area but was not actually used. Incendiary activity was expected in the brush areas along the city fringe and in the mountains. Equipment and men of the California Division of Forestry and of the U. S. Forest Service were kept on guard against this. The California Division of Forestry moved up equipment from as far away as Northern California as a precautionary measure.

The Los Angeles Police Department and the Los Angeles Sheriffs Department provided protection for the fire services as best they could considering their involvement with the rioters. Starting Saturday night the National Guard took over much of the protection of firemen allowing the police services to concentrate on law enforcement activities.

No joint-agency command centers were set up during the fires, although this arrangement is common practice in brush firefighting situations where two or more jurisdictions are involved. Both City Fire Department and the County Fire Department established one or more field command centers and equipment pools of their own. These were located on the fringes of the fire zone. Both fire services exchanged liason officers, however, and had radio contact with one another. The Police Department and the Sheriffs Department each established a field command center and exchanged liaison officers with each of the fire services and with each other.

The County Fire Department handled about 1/4 as many fires as the City Fire Department, or about in proportion to the area protected by each. However, the entire County Fire Department was mobilized for the emergency.

Collapsing buildings broke many branch gas lines. These caught fire and burned continuously at least through Sunday night. These fires undoubtedly were responsible for many of the rekindles. Utility companies refused to send repair crews in to shut off the gas because the police services could not guarantee their safety. Secondary fires from ruptured gas and electric lines also would be a hazard in a situation of nuclear attack.

OPERATIONS AND TACTICS

Descriptions

The fire services were forced by circumstances to change drastically their normal organization and tactics for suppressing urban fires. They instituted instead a "Task Force" or "Commando" type of operation (Fig. 8) similar to the type used in the Los Angeles area for fighting fires in the brush.

Small groups of equipment were organized into Task Forces which operated more or less independently in fighting the fires. They used a "flood and run" tactic which enabled them to hit the fires hard and then move on. These tactics enabled the Task Forces to service the maximum number of fires possible in a given period of time but to

Figure 8. Engine company from a Los Angeles County Fire Department task force responding to a market fire at 4730 Avalon Blvd. during the riot fires. (Los Angeles County Fire Department Photo)

remain at a particular location a minimum length of time. The tactics used were credited by most knowledgeable observers for the success the fire services in handling the Riot Fires. These tactics appear to have application in fighting multiple fires following nuclear attack.

The Task Force type of operation was initiated early in the emergency. A Task Force generally consisted of two or more engine companies, a truck company, and a chief officer. Two alternate types of Task Forces were used:

1. In some instances, the Task Force was formed at the time of dispatch. This method was utilized primarily when the number of possible Task Forces exceeded the number of chief officers available. Chief officers were rotated on assignments taking with them each time a different group of companies.

2. A second type of Task Force consisted of a permanent entity. A chief officer was assigned a group of companies with which he worked at each emergency. When available, members of the Police Department and National Guard were permanently assigned to these Task Forces, remaining with the same group for all the emergencies.

Some of the reported advantages of the Task Force type of operation are:

1. Affords the Task Force Commander ample opportunity to familiarize himself with the personnel and equipment at his disposal.

2. Focuses and pinpoints "Unity of Command" for all personnel involved.

3. Eliminates the confusion ordinarily associated with major emergencies due to the vagueness and overlapping of authority.

4. Helps to discourage attacks by small bands of rioters.

5. Provides members with a feeling of security.

6. Enables the officer-in-charge to deploy companies from the beginning of deployment.

7. Reduces the danger of accidents as apparatus are not responding from various locations.

8. Reduces radio traffic. Only one unit uses the radio rather than several units.

9. Makes one individual responsible to the command post for a group of companies.

10. Has the possibilities of making one individual responsible for seeing that a given number of members are fed, rested, and relieved.

11. Relieves the central command post of many details.

12. Reduces the tendency for Sector Commanders to wander.

13. Prevents stealing of companies by other chief officers.

Some of the disadvantages of the Task Force type of operation are:

1. Slows down initial response from quarters.

2. Might lead to poor public relations due to slowness of response.

3. Makes response distance excessive in some instances.

4. Ties up companies unnecessarily on small fires.

The advantages appear to far outweigh the disadvantages in widespread multiple fire situations like the Riot Fires.

It should also be pointed out that many city and county fire houses had to be evacuated early in the emergency. Therefore, many engine companies had no houses to return to after completing an assignment had they wanted to. Normally, it is standard procedure for companies from several houses to respond to a particular fire. They return to their respective houses when the fire is secured.

The fire services organized on the periphery of the curfew area utilizing fire houses that were tenable and equipment pools set up in open areas (Fig. 9). Quick sorties were made into the fire area to attack the fires.

The fires were knocked down as quickly as possible using wagon batteries and ladder pipes. Overhaul and salvage operations were minimized and even disregarded in many instances.

A maximum effort was made to protect exposures, even at the expense of not attempting to extinguish the main fire. Where handlines were used, streams usually had to be applied from a location which was at some distance from the structure (Fig. 10). This was because structures usually were well-involved before firemen arrived and because of the hazard to firemen from looters that might be in the buildings. There was also danger that rioters outside might cut the hoselines or otherwise incapacitate firemen standing guard outside for fellow firemen working inside the building.

Fire service helicopter scouting and surveillance was extremely important for locating fires and directing movement of equipment. In addition, live TV coverage of the fire situation provided the fire commanders with some excellent information to assist in directing suppression activity. The KTLA "Telecopter" provided coverage of

Figure 9. Equipment pool and command post on edge of curfew area operated by Los Angeles Fire Department. (Los Angeles City Fire Department Photo)

Figure 10. Task force Engine Company of Los Angeles County Fire Department using the "flood and run tactic." Fireman at left is wearing a flak suit borrowed from the military. (Los Angeles County Fire Department Photo)

fire occurrence and development that made it possible for the fire commanders to know better where the fires were than the men on the ground. Fire activity was monitored on the TV screen in the command center---(See Fig. 11)---the same picture being viewed by the general public. This use of live TV for "disaster analysis" by command centers should be encouraged.

The U. S. Forest Service Firescan aircraft flew the fire areas Sunday, August 15. Some good imagery of fires and the terrain were obtained by the infrared scanner.

Application to Nuclear Fires

It appears that the harassing actions of the rioters were similar in effect to fallout keeping the fire services from entering the affected area or limiting their length of stay. Both Chief Brunton of Los Angeles County Fire Department and Chief Hill of Los Angeles City Fire Department agreed to this analogy.

The organization and tactics used by the fire services to counteract these hazards are the sort that will be useful to fight the many simultaneous fires expected to follow nuclear attack. These fires will have to be hit fast and hard with everything available in order to suppress them in the short time available before the arrival of fallout.

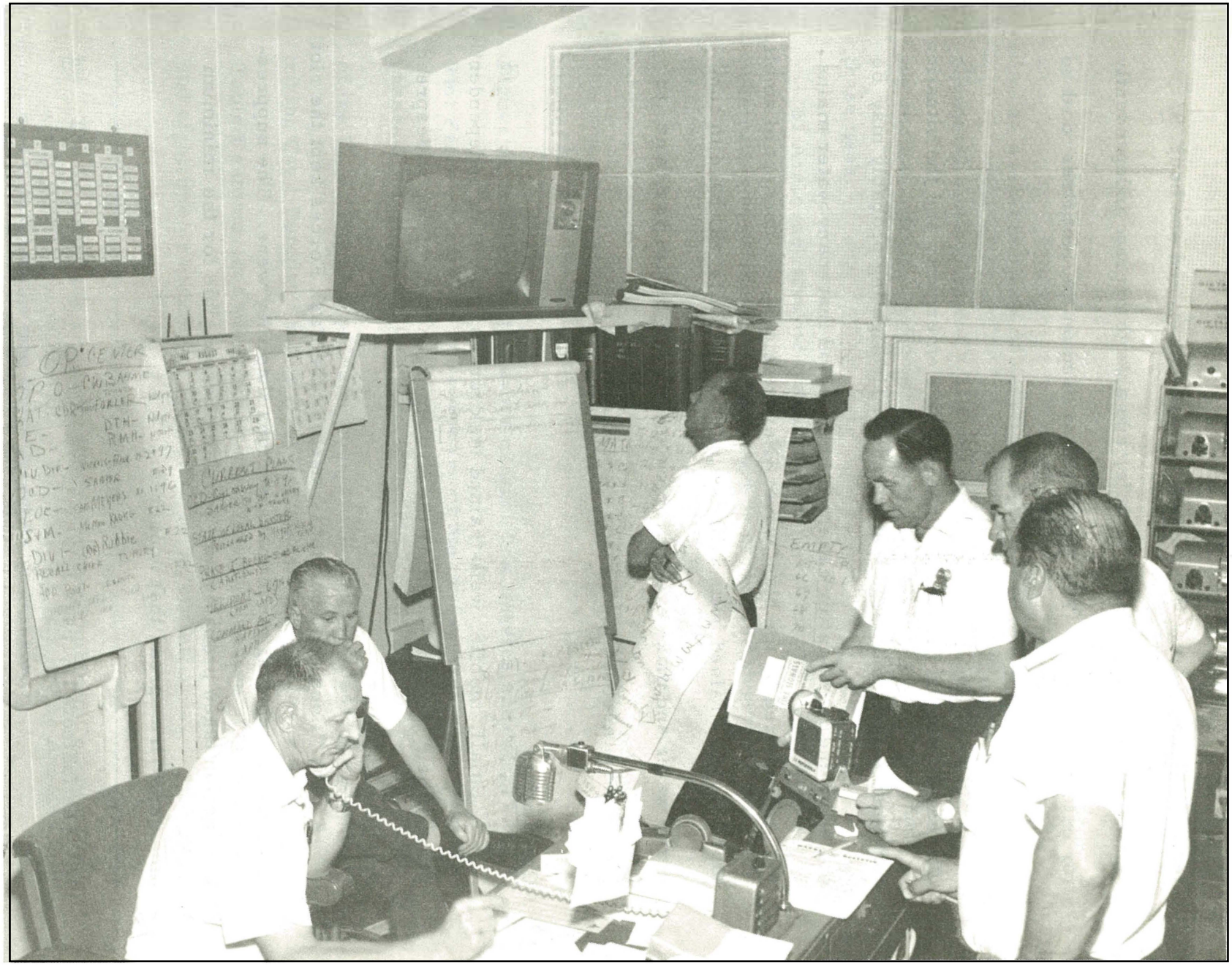

Figure 11. Command center, Los Angeles City Fire Department monitoring live TV coverage of the fire area by helicopter to get the latest information on fire occurrence and spread. (photo courtesy of Los Angeles City Fire Department)

Indications are that the time available will not exceed one hour. 9/ Units will have to be small, mobile, and able to operate independently for extended periods. The Task Forces used on the riot fires did just this.

The big difference between the present fire emergency and the situation following nuclear attack is that water for firefighting probably may be quite limited in the latter case. It is expected that many water mains will be ruptured by the blast wave. Nevertheless, the concept of small, mobile, well-trained units still is applicable. Units will have to conserve water and make every drop count. It will be important to have alternate sources of water available.

Conclusions

1. Small, mobile, well-trained task forces, operating independently proved their worth in handling the fire emergency involving widespread multiple ignitions.

2. The "flood and run" tactic used by the Task Forces kept the riot fires from becoming much more serious than they were. The suppression action taken probably was partially responsible for the minimum amount of fire spread that occurred.

9/ See footnote 1/, page 1.

3. The task force type of organization, peripheral organization and command, and the flood and run tactics used are applicable to suppressing nuclear-set fires.

4. Aerial methods of scouting, surveillance, and movement of personnel and equipment will be important for handling fires following nuclear attack. Helicopters appear particularly promising for these uses.

5. Airborne infrared mapping systems, which have the ability to penetrate smoke and are not affected by darkness, show promise for monitoring fires in nuclear attack situations.

SHELTERS AND NUCLEAR FIRE THREAT

Shelters

Figure 12 is a map of the south-central Los Angeles area where the Riot Fires occurred. The boundary of the curfew area which encompasses all of the fires is shown. Superimposed on this are the limits of the U. S. Postal Zip Code Zones which form the basis for summarizing Civil Defense shelter facilities and population in the area.[10/] Table I summarizes the number of facilities, licensed shelter spaces, and nighttime or maximum population in the curfew area.

10/ The Los Angeles area recently adopted a combined County and City Civil Defense organization. The official title is Los Angeles County and City Disaster and Civil Defense Commission.

Figure 12

Boundaries of Riot Fire area and Civil Defense shelter zones in Los Angeles

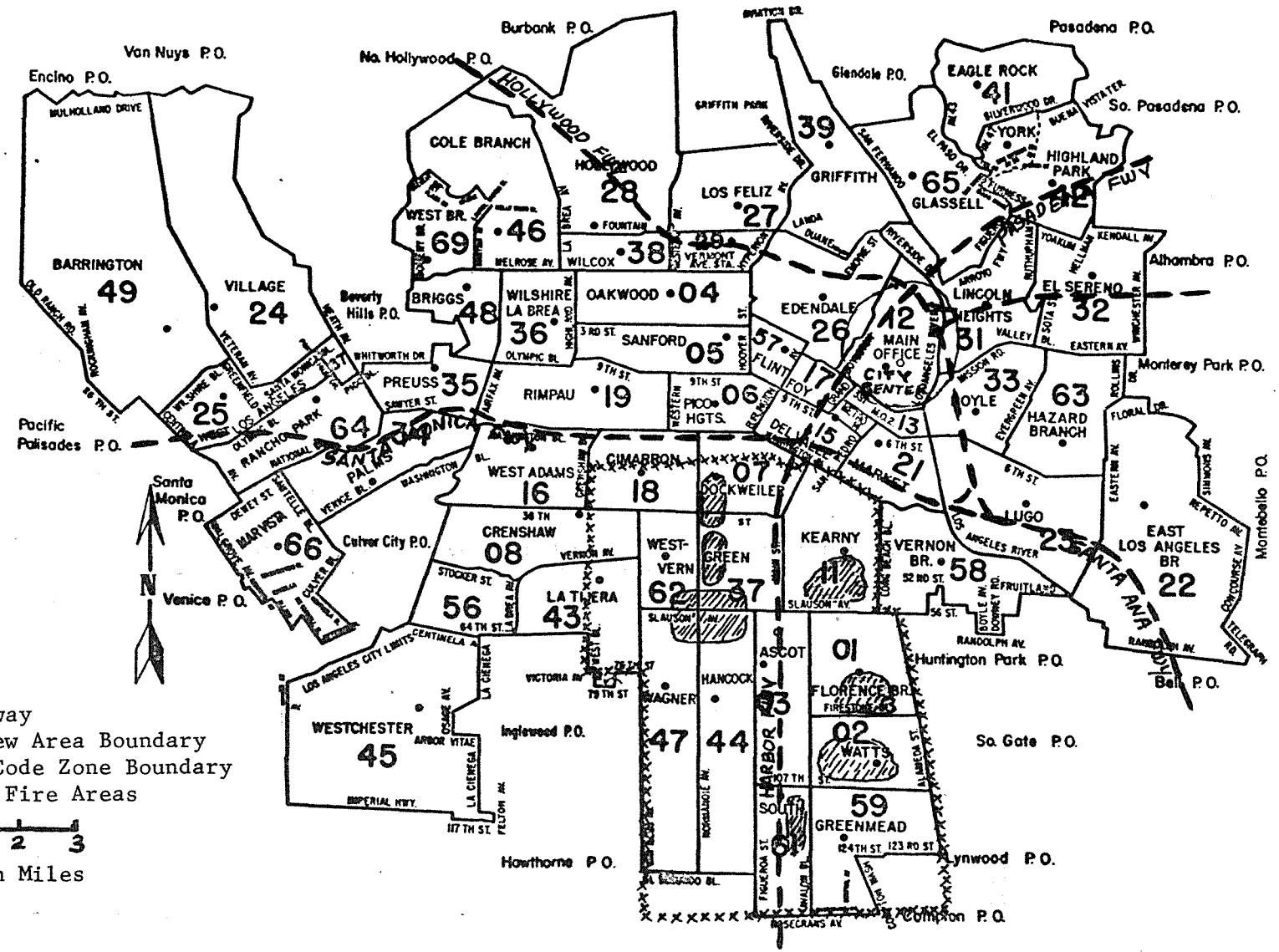

Table 1

Population and Shelter Space Summary, Curfew Area,
Los Angeles Riot Fires

Zip Code Zone	No. Facilities	Licensed Spaces	Population 1/	Shelter Balance 1/
90001	3	489	-	-
90002	2	277	-	-
90003	3	171	-	-
90007	43	91,849	-	-
90011	5	1,469	-	-
90037	8	1,090	-	-
90044	6	1,579	-	-
90047	6	3,028	-	-
90058	41	38,644	-	-
90059	1	25	-	-
90061	2	35	-	-
90062	2	758	-	-
Totals	122	139,414	575,873	436,459-

1/ Nighttime situation. The daytime population is estimated to be 525,873.

The summary shows that there are 122 facilities in the zones that are in or are closely adjacent to the curfew area shown on the map. These facilities have licensed shelter spaces for 139,414 people. However, the total nighttime population is 575,873 making a deficiency of 436,459 available shelter spaces. Figures on daytime population are not available although it is known that quite a few residents work outside the curfew area. Assuming that there are 50,000 fewer persons in the area in the daytime than at night there still is a deficiency of 386,459 shelter spaces in the daytime.

This means that shelter space is provided for only one person in four in the curfew area.

Civil Defense officials acknowledge that there is a shortage of shelter spaces in the curfew area. They cite as reasons the lack of suitable large buildings, less substantial types of construction, and the general residential nature of land use in the area.

According to the Civil Defense Director, the Civil Defense Plan calls for residents of the curfew area to seek shelter outside of the area, mostly in the downtown and city center. The records show that there is a large surplus of shelter spaces downtown, even during working hours. Shelter spaces also are more nearly in balance with the population in the zones immediately adjacent to the curfew area to the east and west.

Although shelter spaces are available downtown they are several miles distant from the center of the curfew area. The distance is even greater for residents in the south half of the curfew area where local shelter spaces are most lacking. There is serious question whether the residents could reach the downtown shelters in time in an emergency. Streets might be jammed with refugees and vehicles. In a surprise attack streets might be blocked with debris from blast-damaged buildings and fires in burning buildings might impede their egress.

No designated shelter facilities were burned in the Riot Fires. As far as is known, no persons sought refuge from the Riot Fires in any of these facilities.

A sample of the designated fallout shelters in the curfew area and in downtown Los Angeles were visited to determine the relative degree of fire vulnerability. The most effective shelters visited in the curfew area appeared to be the large, massive classroom and administration buildings on the campus of the University of Southern California. The University is situated in the northern quarter of the curfew area. These were multi-story, masonry or concrete buildings with fire-resistive roofs. Although there were wood-frame windows, the surroundings were clear and there was good spacing between the buildings and across streets.

The Goodyear Rubber Plant, the largest individual shelter facility in the south portion of the curfew area was checked for fire vulnerability. Because of construction and possible exposure from burning rubber stocks in adjacent buildings, it was evident that it would be extremely difficult to defend if fires were moving into the area.

The County Administrative Building in the city center, one of the largest shelter facilities in Los Angeles, was examined for fire vulnerability. This building is one of several large new concrete and glass-type municipal buildings in the government center complex. Surroundings are nonflammable and spacing between buildings is good. The basement levels appears to afford good protection from fire. However, interior portions of some of the above-ground floors also were designated shelters. It appeared that these floors would be suitable as fallout shelters, but would not provide much protection from fire. The shock wave would sweep through opening them up for the entry of firebrands, heat and noxious gases.

In none of the shelters had provisions been made for self-help firefighting in emergency situations. Only the regular wall-type fire extinguishers were available.

Fire Threat

Under "General Assumptions" stated earlier, we proposed to assess the immediate threat if the 1,500 fires had occurred simultaneously; and there was only one hour of effective firefighting time available before fallout arrives.

It seems evident that had the 1,500 fires occurred at nearly the same time and under the stated weather conditions, control within one hour would have been very unlikely. Even with the excellent mutual aid arrangements in effect in the Los Angeles area, the combined efforts would probably not have been successful in controlling the fires in the short time available. As we have seen, the fire services were not able to control in six hours time the approximately 500 fires that occurred Friday night. With even moderate wind the situation would have been even worse. The consequences of 1,500 uncontrolled fires in the Los Angeles metropolitan area would be (1) the destruction by fires of vast areas of industrial and residential developments, and (2) to threaten fallout shelters in a large part of the city.

OBSERVATIONS

1. The effects that nuclear fallout would have on firefighting capabilities is not recognized nor understood by the public, by local Civil Defense, or by the fire services. They do not appear to appreciate the fact that with multi-megaton weapons, depending on targeting, there will be a large ring or doughnut-shaped area where even unsheltered persons will survive the blast wave but where millions of fires will be set. Current feeling seems to be that an attack with superweapons on Los Angeles will kill everyone immediately by blast or fallout. Hence, there is little use to worry about putting out the ensuing fires. They acknowledge that mass fires will develop but feel they would be dead, so why worry?

2. The Los Angeles fire services personnel interviewed were reluctant to recognize that they might need to seek shelter after an hour of fighting fires. They maintain that in accordance with previous training and policy they would probably continue to fight fire in the face of fallout. There were indications of this on the Riot Fires. In several instances chief officers, over their own protest, had to be ordered by their superiors not to enter or to withdraw from areas where fires were burning but where rioters were shooting at firemen and attacking them with bricks and bottles. Their training and experience had instilled in them the instinct to suppress the fires at all costs. They probably would react the same way in fallout situations.

3. The theory that nuclear weapons could cause initial ignitions within even a limited radius out from ground zero is not fully accepted.

4. There seems to be a need for a better understanding of (a) the effects of nuclear fallout, and (b) the fire problem that might result from an enemy attack.

5. If fallout shelters were in the path of a fire that could not be controlled within a one-hour period, the fire services felt that the shelters should be evacuated, but that they should not be ones to do the job because they would be busy with the fires. Evacuation would be either by police or independent action. There may be an analogy to this in the Riot Fires. The fire services understood that it was their job to fight fires, not to disperse crowds of rioters or stop looters. Nevertheless, firemen reported that at times they were inclined or tempted to help with these other tasks especially when they saw these activities going on and no police were on hand to do the job.

6. Fallout shelter distribution is a critical problem in Los Angeles. There appears to be a large surplus of shelter spaces for the daytime, downtown working population but there is an even larger deficit of spaces in the outlying areas including the curfew zone. Due to distance and access problems it does not appear feasible for any significant portion of the persons in the areas of deficit to use spaces in the area of surplus downtown. The problem appears to be one of providing more local shelter spaces in the outlying areas.

7. Critical fire weather appears to be associated with many of the large urban fires in Los Angeles. This is particularly true in the suburban areas fronting on the San Gabriel Mountains but also applies to purely urban areas on the costal plain. The structural characteristics of the city seem to encourage a response to fire weather changes in much the same way as wildland fuels. The low wind speed during the Riot Fires was favorable to development of a firestorm but unfavorable to development of a conflagration. The unusually high humidity during the incident was unfavorable for either type of fire behavior and undoubtedly contributed to the low incidence of spotting.

8. Citizen action could be effective in extinguishment of small ignitions immediately after a nuclear attack and before taking shelter from fallout. It is known that during the riot fires many incipient incendiary fires set by the rioters were extinguished by public spirited residents in the curfew area. Some of these persons probably put themselves in considerable danger of reprisals to do this. In order for a self-help program to be effective, education and training would be required.

9. A nuclear thermal pulse in some area of Los Angeles could cause so many fires that only selective control action would be feasible. This was demonstrated during the Riot Fires. The 500 or so fires on Friday and Saturday nights exceeded the capacity of the fire services and forced them into selecting key fires on which to concentrate control effort.

10. Current fire control effort in Los Angeles is geared to an almost unlimited water supply. No attempt was made to assess the situation if only limited water supplies were available.

GENERAL CONCLUSIONS

1. Many of the shelter buildings could not be protected adequately from within because of building construction and exposure to nearby fire susceptible buildings.

2. If shelter buildings are spaced and constructed so they offer some resistance to fire, effective fire guard activity would be possible; heavy fallout and fire susceptible buildings would make fire guard activity less effective.

3. For fire guard activity to be effective the proper types of self-help equipment would have to be provided. At the present time there is no program to provide this equipment in shelter facilities in the Los Angeles area.

4. Fallout shelters in office buildings and schools in the Los Angeles area do not generally provide adequate protection from a spreading fire. At the present time, however, there is no alternative to using these facilities because Los Angeles has no structures that are located deeper underground and are more extensive such as a subway system.

5. Structural characteristics, building spacing, and materials used in siding, roofing, and general construction are major factors in considering whether or not an area would be defensible if multiple ignitions occurred. Building exteriors have a pronounced effect on fire spread and development.

6. Structural fires spread relatively slowly into the wind so that freeways or even wide streets and railroad rights-of-way may halt the spread of fire to a large extent.

7. Some control effort is needed to stop an urban fire moving into the wind except where wide firebreaks are present. Freeways may be inadequate to stop fire spread by fire brands, particularly if the fire reaches the break unchecked.

8. If multiple ignitions, equal or larger in number than the Riot Fires, occurred anywhere in Los Angeles, the entire community would be threatened - in fact, the area probably would have to be "written off".

9. If many fires start simultaneously the fire service personnel will attempt selective control and sacrifice some areas that could not be defended. This happened on the Riot Fires.

10. Fallout shelters should be risk-rated for fire vulnerability so pre-emergency planning could identify which shelters might be defended from fire and which would have to be evacuated.

11. In pre-emergency planning, the Los Angeles fire services and civil defense emphasized the need to expand on the existing organization to meet emergencies of unpredictable proportions.

12. From the standpoint of shelter fire defense, it appears that a system of smaller decentralized shelters would be preferable to large centralized shelters. The people would have more chance of reaching the shelters in time and those individuals needed for firefighting would be available in the area. These fire guard personnel would be able to spend the maximum amount of the time available before the arrival of fallout in fighting fires.

13. Personnel for an expanded fire control organization must be assured of readily available shelter spaces to go to when the arrival of fallout terminates their firefighting efforts. Otherwise, they might not be so willing to expose themselves after the others have taken shelter.

14. The successful use of mobile hand lines, rather than stationary master streams, on the Riot Fires indicates a need to adapt this tactic to handling multiple small fires in other areas.

15. The "flood and run" tactic used so successfully on the Riot Fires was based on the availability of almost unlimited quantities of water. Very possibly water will be in short supply following nuclear attack. This points up the need to develop means to conserve water, develop alternate sources of water, and the need to hit the fires hard while they are small.

RECOMMENDATIONS

1. Education in the effects of nuclear weapons, particularly the relative distance from ground zero that thermal and blast can cause fires and damage in relation to fallout arrival times, is needed for both public officials and the general public. Educational programs should be designed to meet expected occurrences, i.e., the fire problem resulting from nuclear attack of the city of Los Angeles.

2. The threat of fire resulting from a nuclear attack on Los Angeles emphasizes the need for developing a system of rating fallout shelters for fire vulnerability. This fire risk rating for each shelter facility would permit early recognition of hazardous shelter spaces.

3. Continue effort to locate fallout shelters in outlying areas that provide for maximum fallout and fire protection both from without and within. This shelter capacity is needed in the vicinity of people's homes and would mean utilizing more residences or other buildings having a relatively low shelter capacity.

4. Cities and communities should develop a plan that clearly defines the responsibilities for evacuation and rescue for various levels of emergencies - including nuclear attack.

Appendix------Amended Rule No. 1

(establishment of Curfew and State of Extreme Emergency)

COPY

EXECUTIVE DEPARTMENT
State of California

AMENDED RULE NO. 1

In the light of the state of extreme emergency now existing in the County of Los Angeles, and pursuant to the authority vested in me to promulgate, issue and enforce rules, resolutions and orders, I deem the following rule and regulation necessary for protection of life and property and hereby amend Rule No. 1 as previously issued on August 14, 1965, by Acting Governor Glenn M. Anderson, to be effective immediately as amended, as follows:

CURFEW:

No person shall be upon the public street, avenue, alley, park or other public place or unimproved private realty within the area bounded as follows:

> Starting at the intersection of Washington Boulevard and Almaeda Street, then proceeding westerly to Flower Street, then south on Flower Street to Adams Boulevard, then westerly on Adams Boulevard to Crenshaw Boulevard then southerly on Crenshaw Boulevard to Florence Avenue, then easterly on Florence Avenue to Van Ness Avenue, then southerly on Van Ness Avenue to Rosecrans Avenue, then easterly on Rosecrans Avenue to Alameda, northerly on Alameda Street to the starting point, all named streets included, between the hours of 8:00 p.m. and the time of sunrise the following day.

This curfew shall not apply to policemen, peace officers, firemen, or other emergency personnel or civilians engaged in police or emergency work. This rule shall not apply to authorized representatives of any news service, newspaper, or radio or television station or network.

Any violation of this rule shall be punished as provided by Section 1600 in the Military and Veterans Code.

This rule shall remain in effect until such time as it is rescinded.

Dated: August 15, 1965.

(sig.) Edmund G. Brown
GOVERNOR OF CALIFORNIA

ATTEST:

SECRETARY OF STATE